



EnduroFlow™ Series EF12

Solar Powered Ultrasonic Flowmeter for Remote Flow Measurement

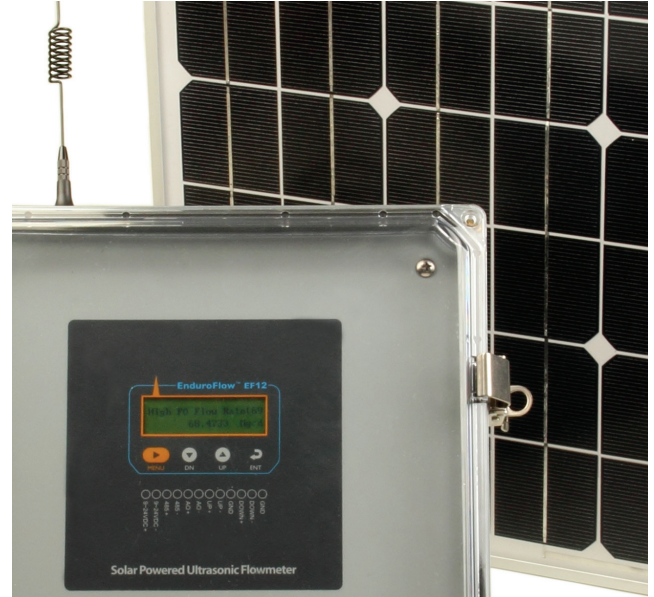
Applications

The EF12 Solar Powered Ultrasonic Flowmeter is an ideal solution for accurate flow measurement in remote areas where electrical power is not accessible.

With the EF12, you can build a remote flow monitoring network to effectively manage liquid distribution as well as detect pipeline leakages.

The applicable liquids include:

- Water/Wastewater
- Hot/Chilled Water/Mixture of Water and Glycol
- Oil/Crude Oil/Fuel Oil/Diesel/Lubricant Oil/Hydraulic Oil
- Petroleum Products
- Chemical Liquids and Solvents



Features And Benefits

- Solar powered with a rugged 20 Watt solar panel
- Built-in rechargeable battery and charging circuit allowing 7 days of operation without sunlight
- Robust, UV resistant, NEMA4X weather-proof enclosure
- Low-power consumption GPRS modem for remote monitoring and control (optional)
- Accurate bi-directional flow measurement
- No moving parts to wear and tear. No maintenance required
- NIST-traceable factory calibration
- Suitable for pure liquids and liquids with some particles. No dependency on conductivity
- Easy to use and set up
- Alarm messaging to cell phones or central station when leakage or special event is detected
- 4-20mA analog inputs for temperature, level, pressure or other standard transmitters
- Thermal energy measurement capability (an additional pair of RTD sensors is needed)
- Internal data logger: last 512 daily net flow values
- Large storage SD data logger for logging flow, status, temperature and other parameters (optional)
- Compatible with various types of transducers:
 - o Clamp-on transducer: non-contact, non-invasive, easy and economical installation, no pipe work necessary
 - o Insertion transducer: robust, excellent long-term stability, hot-tapping installation, no need to shut down the flow
 - o Flow-cell transducer: most accurate and robust. Plug and play. Excellent long-term performance
- Compatible with Spire Metering's uGalaxy wireless telemetry system



DS-EF12-1210_Rev.8



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EnduroFlow™ Series EF12

Solar Powered Ultrasonic Flowmeter for Remote Flow Measurement



A member of the EnduroFlow™ Series, the EF12 Solar Powered Ultrasonic Flowmeter is the third member of the 3rd generation ultrasonic flow meters from Spire Metering. Compared with its predecessors, the 3rd generation flowmeters offer better performance and a richer feature set, all at a lower price.

The EF12 ultrasonic flowmeter is designed to be installed in a remote location where electrical power is not accessible. This unique product has a 20W solar panel, a 17AH rechargeable battery, a low-power consumption GPRS modem, and a high-performance ultrasonic flowmeter. All the components, except the solar panel and transducers, are housed in a weather-proof robust enclosure.

With no moving parts to wear and tear, the EF12 does not require maintenance, thus, it is ideal for remote deployment. Based on state-of-the-art ultrasonic transit-time technology, the EF12 is able to conduct accurate flow measurement on a closed pipe carrying pure liquids or liquids with some suspended particles. The EF12 can be equipped with clamp-on or wetted (insertion or flow-cell) type transducers to meet various application challenges.

Signal Quality Tracking

The EF12 flowmeter utilizes cutting-edge technologies such as advanced transducer design, low voltage transmission, digital signal processing, self adaptation, and more, to achieve high performance. The proprietary

quality tracking mechanism analyzes the quality of the received signal and automatically tunes the meter system to its optimized condition. This mechanism leads the system to be easily adaptable to pipe material variations and liquid property changes.

Transducer Pairing and Wetted Calibration

As quality is of crucial importance, all transducers are carefully paired, and all flowmeters are wet-calibrated on the flow loop in the factory to further ensure the system accuracy and reliability.

Versatile Interfaces

The EF12 provides versatile input/output interfaces. It has two 4-20mA inputs to accommodate temperature, pressure, or level transmitters. It has one RS-485 port which can be connected to a GPRS wireless modem to make remote flow monitoring easy and reliable.

With GPRS option, the EF12 is able to detect leakage, other special events, and send alarm message to cell phones or the central station. It can also be programmed or controlled remotely from your office.

Non-intrusive. Non-obstructive

With clamp-on transducers, the installation becomes very simple and easy. No pipe work is required and there is no risk of leaking or contamination. With wetted transducers, there is no obstruction to the flow, thus, there is no pressure drop.

Economical to Own and Operate

The ultrasonic transducers are made from crystal. There are no moving parts to wear and tear. The entire meter system is completely solid state. Therefore, the EF12 is a robust and reliable system. It does not require maintenance or downtime which eliminates any potential maintenance costs.



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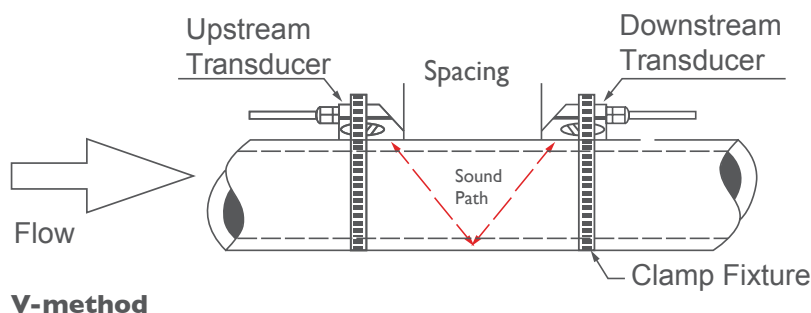
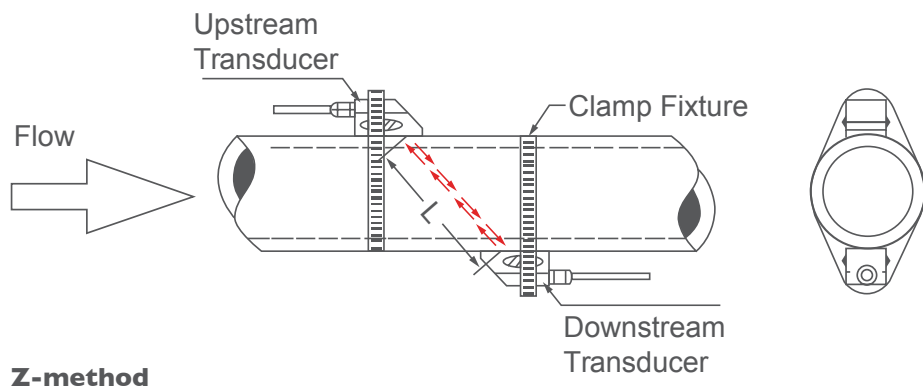
Solar Powered Ultrasonic Flowmeter for Remote Flow Measurement

Measurement Principle

The EnduroFlow™ Series flowmeters are based on the transit-time measurement principle. The system utilizes a pair of sensors (A and B in figure below) that function as both ultrasonic transmitter and receiver. The sensors are installed on the pipe wall, either clamped on the outside of the pipe or inserted into the pipe at a specific distance from each other, and the flow meter operates by alternately transmitting and receiving a coded burst of sound energy between the two sensors and measuring the transit time it takes for sound to travel between the two sensors. The difference in transit time is directly related to the velocity of the liquid in the pipe. The flowrate is then calculated based on the transit-time difference, the geometry of the pipe and the fluid dynamics formula.

The sensors are commonly mounted with the Z-method or the V-method. With the Z-method, the two sensors are installed on opposite sides of a pipe. This method offers shorter sound path, thus, better signal strength. It is often used for large size pipes where signal strength is more important. With the V-method, the two sensors are installed on the same side of the pipe. The sound path is doubled, and as a result, the measurement accuracy is better. This method is often used for small and medium size pipes.

For flow-cell type transducers, however, only the Z-method is used.





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Typical Transducer Installation

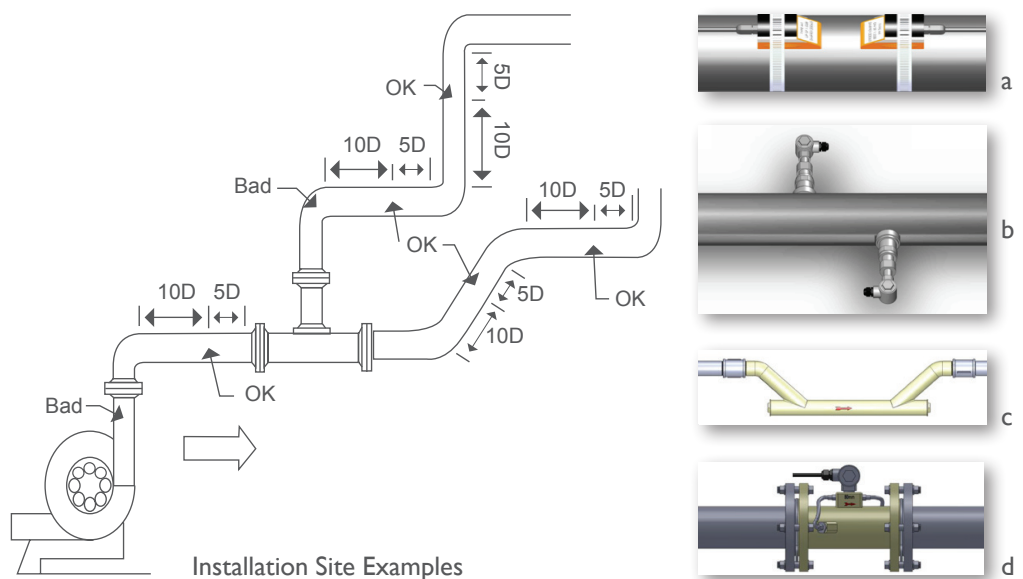
The four figures below illustrate how the transducers are installed on a pipe. The clamp-on transducer (figure a) is mounted on the outside of a pipe with a mounting fixture using the V-method. The insertion transducer (figure b) is hot-tapped or cold-tapped onto the pipe using the Z-method. The flow-cell (spool-piece) transducer comes in two

varieties. For sizes DN40 (1 1/2") or smaller, PI-type transducers (figure c) are used and the pipe joint could be threaded or flanged. For sizes DN50 (2") and larger, the transducers are configured in a standard spool-piece with two ultrasonic sensors installed via the Z-method (figure d) where it is normally connected to a pipe line using a flange.

Transducer Mounting Site Selection

The site of the transducer installation is very important. Here are some recommendations for selecting the right site:

- In order to achieve good accuracy, it is recommended to have 15D straight-pipe run: upstream 10D and downstream 5D, where D is pipe diameter.
- If there is a valve upstream and the valve is not fully open, it could generate flow disturbance. A longer upstream straight pipe is recommended.
- If there is a pump upstream, we recommend to have 25D straight pipe run.
- If the pipe is vertical, make sure the flow is going upward, not downward. Downward flow could have air gaps if the flow is in a free fall.
- If the pipe is horizontal, make sure the pipe is full! The transducers should be installed on the side of the pipe, not on the top or bottom of the pipe.





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Specifications: Flow Transmitter (Main Unit)

Flow Velocity	± 10 m/s (± 32 ft/s). Bi-directional
Accuracy	±1% of reading ±0.008m/s (±0.03ft/s) in velocity*
Repeatability	0.2%
Response Time	0.5s. Configurable between 0.5s and 99s
Display/Keypad	LCD with backlight. 2 x 20 letters. 4 x 4 tactile-feedback membrane keypad. Displays instantaneous flow rate, flow total (positive, negative and net), velocity, time, temperature, energy, analog outputs/inputs
Units	English (U.S.) or metric
Physical Quantity	Volumetric flow rate, total flow, velocity, analog inputs
Totalizers	Positive totalizer, negative totalizer, net totalizer, daily totalizer, monthly totalizer, yearly totalizer, manual totalizer
Security	Keypad can be locked with password
Outputs	See below for outputs
• Current Output	Optional 0/4-20mA isolated output for flowrate, velocity or sound speed. Impedance 0-1k. Accuracy 0.1%
• Digital Output	Optically isolated OCT (Open Collector Transistor) output. Up to 0.5A load. Can be programmed as: <ul style="list-style-type: none"> • Pulse signal for flow totalization • ON/OFF signal for special event such as overflow, no flow, reverse flow, leakage alarming, and more • START/STOP signal for batch control Can be used to drive pulse counter, external relay, alarm, PLC counter
• Relay Output	Optional. 1A@125VAC or 2A@30VDC. Can be programmed as: <ul style="list-style-type: none"> • Pulse signal for flow totalization • ON/OFF signal for special event such as overflow, no flow, reverse flow, leakage alarming, and more • START/STOP signal for batch control Can be used to drive pulse counter, external relay, alarm, PLC counter, or, to control pump, valve, light
• Alarm	One alarm, programmable to specific event such as overflow, no flow, reverse flow, leakage, etc.





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Inputs	Two 4-20mA inputs for temperature, pressure or liquid level transmitter Optional temperature channels for accommodating two PT100 3-wire temperature sensors
Recording	Automatically records the daily total of the last 512 days and the monthly total of the last 128 months Optional SD data logger (2GB space) for recording velocity, flow, status, etc.
Communication Interface	RS-485 interface, supporting MODBUS protocol Optional RF / GPRS module for wireless networking, remote monitoring and remote control
Software	Optional StufManager PC software for real-time data acquisition and remote meter control
Telemetry**	uGalaxy_GPRS wireless telemetry systems as well as data service are available upon request
Enclosure	
• Protection	IP66 (NEMA 4X)
• Dimensions	For main unit: 305mm x 254 mm x 102mm (12" x 10" x 4") For solar panel: 420mm x 420 mm x 25mm (17" x 17" x 1")
• Features	Weather-proof Polycarbonate. High-impact, UV resistant. UL-50/c-UL Listed
Weight	12kg (24lbs)
Environment	
• Temperature	Main unit: 0-60°C (32-140°F). Solar panel: -40-80°C (-40-176°F). Transducer: -20-80°C (-4-176°F)
• Humidity	Main unit: 85%. Solar panel: 100%. Transducer: 100%
Power Sources	20W Solar Panel, 12V/17AH rechargeable battery. Already built-in

Notes:

* Under reference condition and velocity should be above 0.5ft/s.

Flowrate is calculated by multiplying velocity with the inner cross-section area of the pipe.

** For wireless telemetry system solution, please contact solutions@spiremt.com.



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Specifications: GPRS Modem

General	<ul style="list-style-type: none"> • Transmitting power: 2W (900MHz) or 1W (1.8GHz) • Receiving sensitivity: <-102dBm • Frequency error: < +/-0.1ppm • Low power consumption • International standard interface • Standard RS-232 interface • DTU device for transparent communication • Auto reset after power off or manual reset
Hardware	<ul style="list-style-type: none"> • Weight: 10kg (20lbs)
Interface	<ul style="list-style-type: none"> • Configuration interface for PC: RS-232 or RS-485, baud rate: 600~9600bps, data bits: 7-8, stop bits: 1-2, odd/even/none • Data package length: If Hexadecimal format, <75bytes; if ASCII format, <150bytes • Antenna interface: SMA (Female) • SIM slot: Drawer-structured, easy to install SIM card
Temperature	<ul style="list-style-type: none"> • Operation temperature: -20 - 55°C (-4 - 130°F) • Storage temperature: -20 - 75°C (-4 - 167°F)
Operating Schedule	<ul style="list-style-type: none"> • Time period for working mode: 0~31,536,000 seconds programmable • Time period for sleeping mode: 0~31,536,000 seconds programmable • Time period for flowmeter data reading: 0~65,535 seconds programmable

Specifications: Solar Panel

Type	Mono-crystalline solar panel
Power	20W
VOC	21.5V
Isc	1.28A
Vmp	17.2V
Imp	1.15A
Charger	12V PWM&SOC charger. 14.4V regulation point, 11.1V disconnect voltage, 13.1V reconnect voltage Short circuit and over current-solar and load protection
Temperature	-40-80°C (-40-176°F)
Protection	water-proof
Dimensions	420mm x 420mm x 25mm (17" x 17" x 1")
Weight	3kg (6lbs)





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How To Order Flow Transmitter (Main Unit)

Please select one option (ID) from each category.

EF12 -

Frequency		ID
0.5MHz	For clamp-on type, pipe size 12"~120"(DN300~3000) or old pipe (compatible with RL transducer only)	0
1MHz	For clamp-on type, pipe size 2½"~28"(DN65~700) (compatible with RMI transducer only)	1
	For insertion type, all sizes	
	For flow-cell type, all sizes	



Attention

You must order both flow transmitter (main unit) and transducer pair to make a complete flowmeter system. Both flow transmitter and transducer should have the same frequency.

Optional Accessories

External Adapter	Model No.
485-USB (to connect to a PC)	WA-485USB
485-GPRS (Must select the Enhanced IP66 Enclosure & Telemetry System option)	WA-YR228



PC Software (485-USB adapter required for PC software use)	Model No.
StufManager (for real-time data acquisition)	SW-STMGR
Telemetry System	Please contact us
Data Logger	Model No.
2GB SD data logger (for recording flow, temperature, and energy)	WA-SD
Solar Mount Kit	Model No.
Horizontal pole mount kit (does not include pole)	WA-SMKIT



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Specifications: Clamp-On Transducer

Model	Picture	Description
Type: RM1 PN#: TWC-RM1		Standard temperature, clamp-on WITH mounting rail, 1MHz Temperature 0°F~176°F (-20°C~80°C) TWC-RM1: 1MHz transducer WITH mounting rail for pipe size DN65-700 (2 ½"-28")
Type: RL PN#: TWC-RL		Standard temperature, clamp-on WITH mounting rail, 0.5MHz Temperature 0°F~176°F (-20°C~80°C) TWC-RL: 0.5MHz transducer WITH mounting rail for pipe sizes DN300-3000 (12"-120")



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How To Order Clamp-on Transducer:

Please select one option (ID) from each category.

TWC -

Transducer Type

Transducer Type	ID
Standard temperature, clamp-on, 1MHz for medium size pipes	
1MHz transducer WITH mounting rail for pipe sizes DN65-700 (2 1/2"-28")	RM1
Standard temperature, clamp-on, 0.5MHz for large size pipes	
0.5MHz transducer WITH mounting rail for pipe sizes DN300-3000 (12"-120")	RL

Required Accessories (choose one from each category)

Transducer Cable	Model No.
5m (15ft) shielded transducer cable (in pair)	TW-CBL-5M
15m (50ft) shielded transducer cable (in pair)	TW-CBL-15M
50m (150ft) shielded transducer cable (in pair)	TW-CBL-50M
100m (300ft) shielded transducer cable (in pair)	TW-CBL-100M
Clamp Fixture	Model No.
Metal strip clamp for DN50-100 (2"-4") pipe	TW-CLP-2
Metal strip clamp for DN125-200 (5"-8") pipe	TW-CLP-3
Metal strip clamp for DN250-300 (10"-12") pipe	TW-CLP-4
Metal strip clamp for DN350-400 (14"-16") pipe	TW-CLP-5
Metal strip clamp for DN450-500 (18"-20") pipe	TW-CLP-6

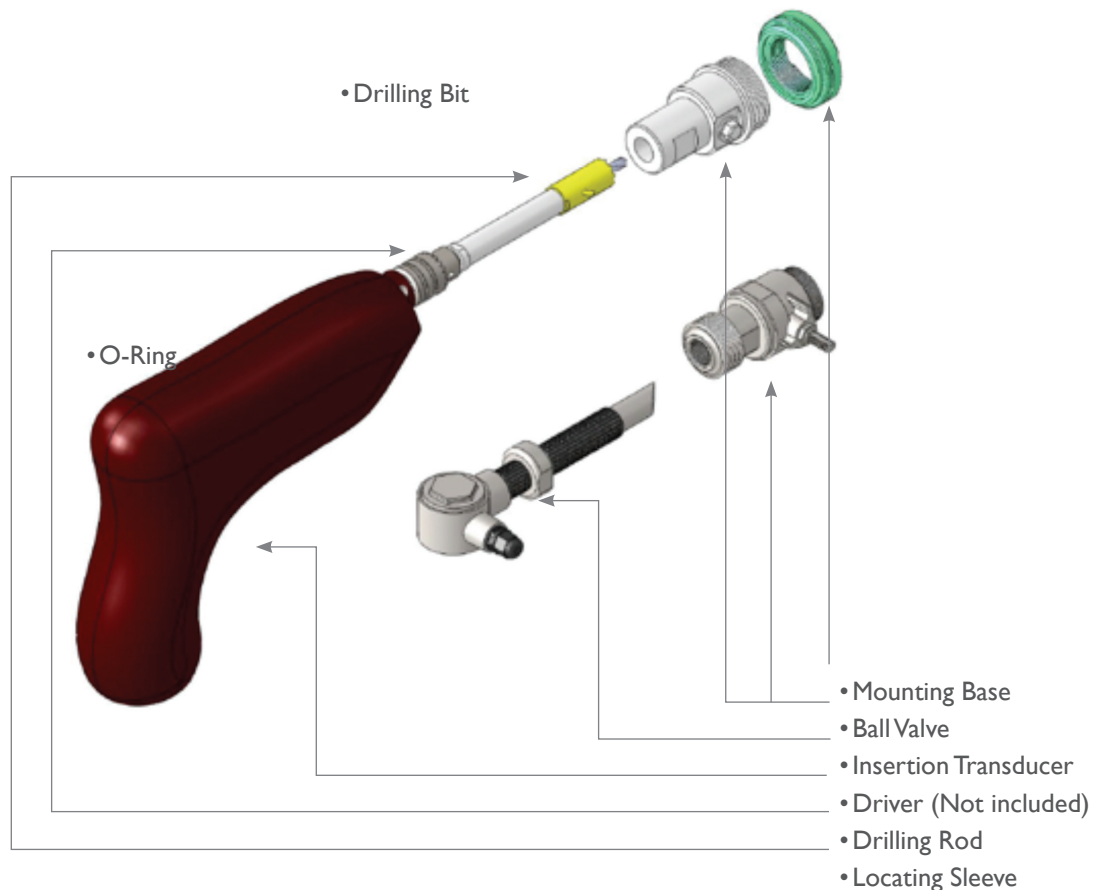


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Specifications: Insertion Transducer

Model	Picture	Description
Type: INS PN#: TWI-V		Insertion transducer, vertical type, 1MHz. For pipe size 3" - 40" (DN80-1000) Temperature range 32°F - 300°F (0°C - 150°C)
Type: INS PN#: TWI-I		Insertion transducer, inclined type, 1MHz. For pipe size 3" - 40" (DN80-1000) Temperature range 32°F - 300°F (0°C -150°C) (Not recommended)
Type: PN#: TWI-HTK		Hot-tapping tool kit for insertion transducer installation





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How To Order Insertion Transducer

Please select one option (ID) from each category.

TWI - - - -

Type	ID
Vertical	V
Inclined	I
Pipe Size	ID
3" - 38" (DN80-DN1000mm)	1
40" - 120" (DN1000-DN3000mm)	2
Pipe Material	ID
Steel	1
Plastic	2
Concrete	3
Other, please specify	4
Pressure	ID
0.6MPa (87psig)	A
1MPa (145psig)	B
1.6MPa (232psig)	C
2.5MPa (362psig)	D
Other, please specify	E

Required Accessories

Cable Length	Model No.
5m (15ft)	TW-CBL-5M
15m (50ft)	TW-CBL-15M
50m (150ft)	TW-CBL-50M
100m (300ft)	TW-CBL-100M
Hot-tapping Tool Kit	TWI-HTK



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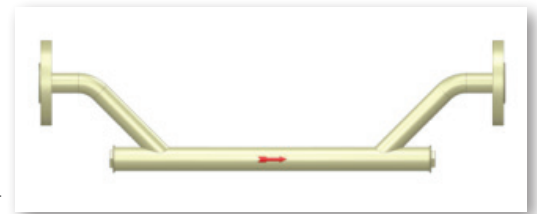
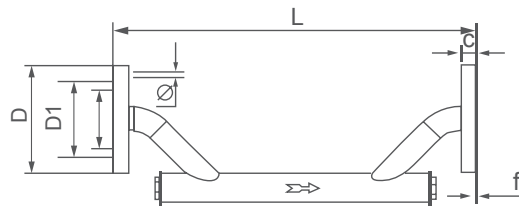
Specifications: Flow-Cell Transducer

Flow Cell	Pipe Size Range	Temperature Range	Flow Vel. Range	Pipe Joint
PI-type	3/8" - 1 1/2" (DN10-40)	32° - 266°F (0° - 130°C)	±15ft/s (±5m/s)	Thread/Flange
Standard-type	2" - 40" (DN50-1000)	32° - 266°F (0° - 130°C)	±24ft/s (±8m/s)	Flange

PI Type Flow-cell Transducer

Unit: mm

Nominal Size DN		Length L	Flange Dimension (DIN)					Flange Thickness C
mm	in		D	D1	D-Φ	D2	f	
10	3/8"	300	90	60	4-14	41	2	14
15	1/2"	320	95	65	4-14	46	2	14
20	3/4"	360	105	75	4-14	56	2	16
25	1"	390	115	85	4-14	65	3	16
32	1 1/4"	450	140	100	4-18	76	3	18
40	1 1/2"	500	150	110	4-18	84	3	18



Notes :

- The above flange is DIN type. ANSI flange is available upon request.
- Threaded pipe joint, BSP or NPT, is available upon request.



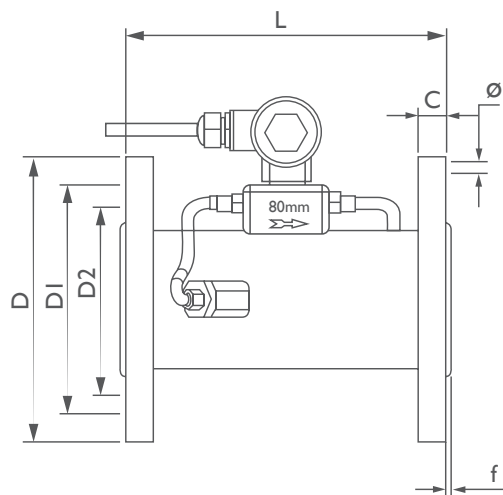
EnduroFlow™ Series EF12

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Standard Type Flow-cell Transducer

Unit: mm

Nominal Size DN		length L	Flange Dimension (DIN)			Sealing Face		Thickness C
mm	in		D	D1	Φ X n	D2	f	
50	2"	200	165	125	18x4	99	3	20
65	2 ½"	200	185	145	18x4	118	3	20
80	3"	225	200	160	18x4	132	3	20
100	4"	250	220	180	18x8	156	3	22
125	5"	250	250	210	18x8	184	3	22
150	6"	300	280	240	22x8	211	3	24
200	8"	350	340	295	22x12	266	3	24
250	10"	450	405	355	26x12	319	3	26
300	12"	500	460	410	26x12	370	4	28
350	14"	550	520	470	26x12	429	4	30
400	16"	600	580	525	26x12	480	4	32
450	18"	700	640	585	30x20	548	4	34
500	20"	800	715	650	33x20	609	4	36
600	24"	1000	840	770	36x20	702	5	38
700	28"	1100	910	840	36x24	794	5	40
800	32"	1200	1025	950	39x24	901	5	42
900	36"	1300	1125	1050	39x28	1001	5	44
1000	40"	1400	1255	1170	42x28	1112	5	46



Notes :

- The above flange is DIN type. We also offer ANSI RF150# flange as the pipe joint upon request.
- For sizes larger than DN500 (20"), please consult us before placing order.



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How To Order Flow-Cell Transducer

Please select one option (ID) from each category.

TWF - - - -

Flow-cell Size		ID			ID
3/8"	(DN10)	01	8"	(DN200)	13
1/2"	(DN15)	02	10"	(DN250)	14
3/4"	(DN20)	03	12"	(DN300)	15
1"	(DN25)	04	14"	(DN350)	16
1 1/4"	(DN32)	05	16"	(DN400)	17
1 1/2"	(DN40)	06	18"	(DN450)	18
2"	(DN50)	07	20"	(DN500)	19
2 1/2"	(DN65)	08	24"	(DN600)	20
3"	(DN80)	09	28"	(DN700)	21
4"	(DN100)	10	32"	(DN800)	22
5"	(DN125)	11	36"	(DN900)	23
6"	(DN150)	12	40"	(DN1000)	24

Pipe Joint	ID
BSP Threading (only available for size <DN50/2")	A
NPT Threading (only available for size <DN50/2")	B
DIN Flange	C
ANSI 150# Flange	D
Other, please specify	E

Flow-cell Material	ID
Carbon Steel (default)	1
Stainless Steel	2
Plastic	3
Other, please specify	4

Pressure	ID
0.6MPa (87psig) (for sizes >DN500/20")	A
1MPa (145psig) (for sizes from DN300/12" to DN500/20")	B
1.6MPa (232psig) (for sizes from DN50/2" to DN250/10")	C
2.5MPa (362psig) (for sizes <DN50/2")	D
Other, please specify	E

Required Accessories

Cable Length	Model No.
5m (15ft)	TW-CBL-5M
15m (50ft)	TW-CBL-15M
50m (150ft)	TW-CBL-50M
100m (300ft)	TW-CBL-100M

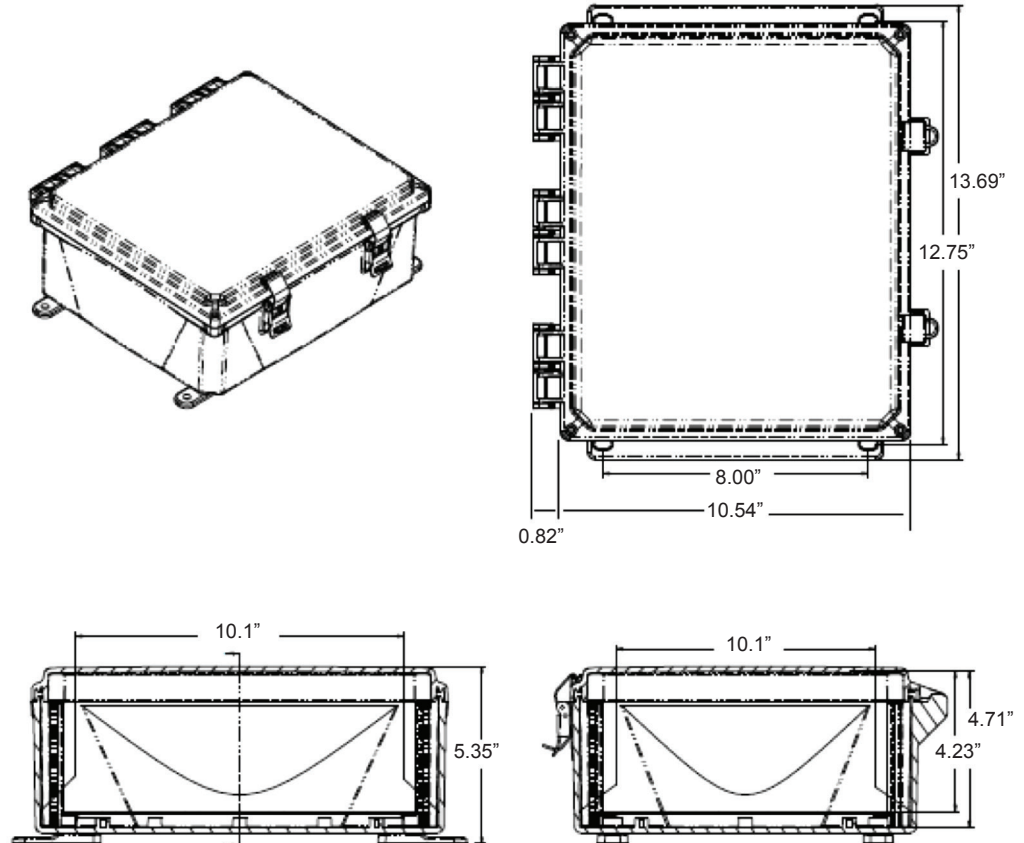




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Dimensions



About Spire Metering Technology

Spire Metering is a global leader in flow and energy management solutions. Through continuous innovation, we transform cutting-edge technologies into affordable, reliable solutions for accurate flow and energy measurement. Spire Metering offers water, heat, electricity and gas meters as well as AMR/AMI, billing, and wireless telemetry solutions. Let us help you with your application today.